



US009915191B2

(12) **United States Patent**
Free et al.

(10) **Patent No.:** **US 9,915,191 B2**
(45) **Date of Patent:** **Mar. 13, 2018**

(54) **AIR INTAKE SYSTEM FOR INTERNAL COMBUSTION ENGINE**

(71) Applicant: **CUMMINS INC.**, Columbus, IN (US)

(72) Inventors: **Paul Douglas Free**, Hope, IN (US); **Jason Robert Griffin**, Greenwood, IN (US); **Alex Edward Priestley**, Warwickshire (GB); **Stephen Sunadh Gidla**, Greenwood, IN (US); **Peter Vinson Woon**, Columbus, IN (US); **Joseph Scot Roederer**, Columbus, IN (US)

(73) Assignee: **CUMMINS INC.**, Columbus, IN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/429,108**

(22) Filed: **Feb. 9, 2017**

(65) **Prior Publication Data**

US 2017/0152791 A1 Jun. 1, 2017

Related U.S. Application Data

(62) Division of application No. 14/489,584, filed on Sep. 18, 2014, now Pat. No. 9,605,630, which is a division
(Continued)

(51) **Int. Cl.**

F02M 35/10 (2006.01)

F02M 31/00 (2006.01)

(Continued)

(52) **U.S. Cl.**

CPC **F02B 31/04** (2013.01); **F02B 75/22** (2013.01); **F02F 1/4235** (2013.01);
(Continued)

(58) **Field of Classification Search**

CPC Y02T 10/146; F02B 75/22; F02B 31/04;
F02M 35/112; F02M 35/1045;

(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,423,602 A 7/1947 Magdeburger
4,274,386 A * 6/1981 Reyes F02M 29/06
123/590

(Continued)

FOREIGN PATENT DOCUMENTS

CN 101074639 11/2007
DE 195 17 079 11/1996

(Continued)

OTHER PUBLICATIONS

Supplemental European Search Report dated Jul. 4, 2016 in EP application No. 14756503.0.

(Continued)

Primary Examiner — Syed O Hasan

(74) *Attorney, Agent, or Firm* — Faegre Baker Daniels LLP

(57)

ABSTRACT

An intake manifold is provided that controls swirl on entry to a combustion chamber. Each intake manifold includes a fin or rib portion positioned to reduce or eliminate swirl induced by the configuration of the intake manifold, particularly when used in a large engine having a left bank and a right bank of combustion chambers. By controlling swirl induced by the intake manifold, swirl consistency is improved between engine cylinders and between the left bank and the right bank, improving the consistency of power output and reducing emissions, particularly particulate emissions, also called smoke.

9 Claims, 8 Drawing Sheets

